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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
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2877	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/720,752	EUSSEN ET AL.	
	Examiner	Art Unit	
	Samuel A. Turner	2877	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 December 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *1 and 2* is/are allowed.

6)☒ Claim(s) *3-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *12/17/07*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 16 October 2007 has been entered.

Information Disclosure Statement

The information disclosure statement(s) submitted on 17 December 2007 has been considered by the Examiner.

Claim Rejections - 35 USC § 102

Applicant's amendment has overcome the rejection of claims 1 and 2 under 35 U.S.C. § 102(e) as being anticipated by Hill(6,819,434). See pages 1-2 of Applicant's remarks.

Applicant's amendment has overcome the rejection of claims 1-4, 9-12, 17-19, and 24 under 35 U.S.C. § 102(b) as being anticipated by Van Den Brink(5,801,832). See pages 2-3 of Applicant's remarks.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 3, 4, 7, 9-12, 15, 17-19, 22, and 24 are rejected under 35 U.S.C. § 102(e) as being clearly anticipated by Hill(6,819,434).

With regard to claim 3, Hill teaches an interferometer system for measuring displacement along at least two directions in an XYZ system of co-ordinates, of an object in a plane substantially parallel to an XY plane(Fig's 2A-2C), said interferometer system comprising:

at least one measuring mirror fixedly connected to said object and comprising a plurality of measuring mirror areas(Fig. 2A, 280);

at least one reference mirror comprising one or more reference mirror areas(Fig. 2A, 283);

a beam generator configured to generate a plurality of radiation beams, said beam generator comprising a beam-splitter block having a beam-splitting surface(Fig. 2A; 220,230,232,240-246);

a plurality of radiation-sensitive detectors configured to convert radiation beams reflected towards said detectors into electric measuring signals(Fig. 2A; 272, 276);

wherein said beam-splitter block is configured to split at least one first beam of said plurality of radiation beams into a first measuring beam and a first reference beam(Fig. 2A; 291,245), said first reference beam only being reflected by one or more first reference mirrors(Fig. 2A, 238) located in a fixed position with respect to said beam-splitter block, said first measuring beam being reflected by a first measuring mirror area(Fig. 2A, at point of reflection of beam 291) of said plurality of measuring mirror areas, and

wherein said beam-splitter block is configured to split at least one second beam of said plurality of radiation beams into a second measuring beam and a second reference beam(Fig. 2A; 294,293), said second measuring beam being reflected by a second measuring mirror area of said plurality of measuring mirror areas(Fig. 2A, at point of reflection of beam 294), and said second reference beam being reflected by a first reflector(Fig. 2A, 242) that is fixedly positioned with respect to said beam-splitter block and by at least one third mirror area(Fig. 2A, at point of reflection of beam 293), which is movable with respect to said beam-splitter block, and

wherein, in use, the second reference beam associated with the at least one second beam exits the first reflector in a direction substantially orthogonal to the

direction of the first reference beam associated with the at least one first beam exits the beam-splitter block and away from the beam-splitter block(beam 293 is orthogonal to beam 245).

As to claim 4/3, wherein said at least one third mirror area comprises a third measuring mirror area fixed to said object(Fig. 2A, at point of reflection of beam 293).

As to claim 7/3, wherein said plurality of radiation beams comprises at least three first radiation beams occupying more than one plane and at least one second radiation beam in a position between two of said at least three first radiation beams(Fig. 2E).

As to claim 9/3, wherein said beam-splitter block comprises a transparent body having a beam-splitting surface and the first reflector is integrally connected to said transparent body and has a reflective surface that extends substantially parallel to the beam-splitting surface(Fig. 2A, 240-242).

With regard to claim 10, Hill teaches a lithographic apparatus(Fig's 2A-2C, 11A) comprising:

an illumination system configured to provide a beam of radiation(Fig. 11A; 1110,1112,1114);

a pattern support configured to support a patterning device that serves to impart said beam of radiation with a pattern in its cross-section(Fig. 11A, 1116);

a substrate support configured to hold a substrate(Fig. 11A, 1122);

a projection system configured to project said patterned beam onto a target portion of the substrate(Fig. 11A, 1108); and

an interferometer system configured to measure displacement of one of the supports(Fig's 2A-2C), wherein said interferometer system comprises,

a plane mirror interferometer system(Fig. 2B);

a differential plane mirror interferometer system(Fig. 2C);

a beam-splitter block(Fig. 2A; 220,230,232,240-246) containing one beam-splitter(Fig. 2A; 220,230,240), at least one mirror(Fig. 2A; 231,233), and at least one retro-reflector(Fig. 2A, 232), such that said beam splitter block is configured to split a beam associated with said plane mirror interferometer system and a beam associated with said differential plane mirror interferometer system into respective measuring beams(Fig. 2A; 291,294) and respective reference beams(Fig. 2A; 245,293);

at least one measuring mirror fixedly connected to said one of the supports and comprising a plurality of measuring mirror areas(Fig. 2A, 280);

at least one reference mirror comprising one or more reference mirror areas(Fig. 2A, 238), and

wherein, in use, a direction of propagation of the reference beam associated with the differential plane mirror interferometer system just before incidence on a reference mirror is in a direction substantially orthogonal to the direction of the reference beam associated with the plane mirror interferometer just before

incidence on a reference mirror and away from the beam-splitter block(beam 293 is orthogonal to beam 245).

With regard to claim 11, Hill teaches a lithographic apparatus(Fig's 2A-2C, 11A) comprising:

an illumination system configured to provide a beam of radiation(Fig. 11A; 1110,1112,1114);

a pattern support configured to support a patterning device that serves to impart said beam of radiation with a pattern in its cross-section(Fig. 11A, 1116);

a substrate support holder configured to hold a substrate(Fig. 11A, 1122);

a projection system configured to project said patterned beam onto a target portion of the substrate(Fig. 11A, 1108); and

an interferometer system configured to measure displacement of one of the supports(Fig's 2A-2C), wherein said interferometer system comprises,

at least one measuring mirror fixedly connected to one of the supports and comprising a plurality of measuring mirror areas(Fig. 2A, 280);

at least one reference mirror comprising one or more reference mirror areas(Fig. 2A, 238);

a beam generator configured to generate a plurality of radiation beams, said beam generator comprising a beam-splitter block having a beam-splitting surface(Fig. 2A; 220,230,232,240-246);

a plurality of radiation-sensitive detectors configured to convert radiation beams reflected towards said detectors into electric measuring signals(Fig. 2A; 272,276);

wherein said beam-splitter block is configured to split at least one first beam of said plurality of radiation beams into a first measuring beam and a first reference beam(Fig. 2A; 291,245), said first reference beam only being reflected by one or more first reference mirrors(Fig. 2A, 238) located in a fixed position with respect to said beam-splitter block, said first measuring beam being reflected by a first measuring mirror area(Fig. 2A, at point of reflection of beam 291) of said plurality of measuring mirror areas, and

wherein said beam-splitter block is configured to split at least one second beam of said plurality of radiation beams into a second measuring beam and a second reference beam(Fig. 2A; 294,293), said second measuring beam being reflected by a second measuring mirror area of said plurality of measuring mirror areas(Fig. 2A, at point of reflection of beam 294), and said second reference beam being reflected by a first reflector(Fig. 2A, 242) that is fixedly positioned with respect to said beam-splitter block and by at least one third mirror area(Fig. 2A, at point of reflection of beam 293), which is movable with respect to said beam-splitter block, and

wherein, in use, the second reference beam associated with the at least one second beam exits the first reflector in a direction substantially orthogonal to the

direction of the first reference beam associated with the at least one first beam exits the beam-splitter block(beam 293 is orthogonal to beam 245).

As to claim 12/11, wherein said at least one third mirror area comprises a third measuring mirror area fixed to said one of the supports(Fig. 2A, at point of reflection of beam 293).

As to claim 15/11, wherein said plurality of radiation beams comprises at least three first radiation beams occupying more than one plane and at least one second radiation beam in a position between two of said at least three first radiation beams(Fig. 2E).

As to claim 17/11, wherein said beam-splitter block comprises a transparent body having a beam-splitting surface and the first reflector is integrally connected to said transparent body and has a reflective surface that extends substantially parallel to the beam splitting surface(Fig. 2A; 240-242).

With regard to claim 18, Hill teaches a device manufacturing method comprising:

providing a beam of radiation using an illumination system(column 36, lines 9-18);

using a patterning device to impart the beam of radiation with a pattern in its cross-section, the patterning device supported by a pattern support(column 36, lines 9-18);

projecting said patterned beam of radiation onto a target portion of t-he a substrate, the substrate held by a substrate support(column 36, lines 9-18); and

determining a position of one of the supports with an interferometer system(column 35, lines 42-43), the determining including

splitting at least a first beam of a plurality of beams, via a beam-splitter block having a beam-splitting surface, into a first measuring beam and a first reference beam, said first reference beam only being reflected by one or more first reference mirrors located in a fixed position with respect to said beam-splitter block, said first measuring beam being reflected by a first measuring mirror area of said a plurality of measuring mirror areas, the plurality of measuring mirror areas part of at least one measuring mirror fixedly connected to the one of the supports(column 14, line 58- column 15, line 18), and

splitting at least a second beam of said plurality of beams, via said beam beam-splitter block, into a second measuring beam and a second reference beam, said second measuring beam being reflected by a second measuring mirror area of said plurality of measuring mirror areas, and said second reference beam being reflected by a first reflector that is fixedly positioned with respect to said beam-splitter block and by at least one third mirror area, which is movable with respect to said beam-splitter block, and said second reference beam being reflected in a substantially orthogonal direction with respect to the first reference beam by the first reflector and away from the beam-splitter block(column 15, lines 31-56), and

converting beams which are reflected towards said detectors into electric measuring signals(column 15, lines 25 and 55).

As to claim 19/18, wherein said at least one third mirror area of said interferometer system comprises a third measuring mirror area fixed to said one of the supports(Fig. 2A, 280).

As to claim 22/18, wherein said plurality of beams of said interferometer system comprises at least three first radiation beams occupying more than one plane and at least one second radiation beam in a position between two of said at least three first radiation beams(Fig. 2E).

As to claim 24/18, wherein said beam-splitter block of said interferometer system comprises a transparent body having a beam-splitting surface and the first reflector is integrally connected to said transparent body and has a reflective surface that extends substantially parallel to the beam splitting surface(Fig. 2A; 240-242).

Claim Rejections - 35 USC § 103

Applicant's amendment has overcome the rejection of claims 5, 6, 13, 14, 20, and 21 under 35 U.S.C. § 103(a) as being unpatentable over Van Den Brink(5,801,832) in view of Loopstra et al(6,020,964). Claims 5, 6, 13, 14, 20, and 21 are dependent on claims 3, 11, or 18 are therefor also overcome any rejection with regard to Van Den Brink(5,801,832).

The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. § 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR § 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. § 103(c) and potential 35 U.S.C. § 102(e), (f) or (g) prior art under 35 U.S.C. § 103(a).

Claims 8, 16, and 23 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Hill(6,819,434).

As to claims 8/3, 16/11, and 23/18; Hill **fails to teach** wherein said plurality of radiation beams comprises at least three first radiation beams arranged to occupy a polygonal volume and at least one second radiation beam arranged to be in a position outside a polygonal volume.

CLAIMS 8, 16, and 23:

Hill teaches adding an additional beam-splitter into the beam-splitter assembly in order to measure additional directions(column 17, lines 22-30).

With regard to claims 8, 16, and 23; it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Hill by adding at least one additional beam-splitter between the source 10 and the beam-splitter 220 in order to provide a third linear displacement(#3) above the linear displacement #1, see figure 2E.

The motivation for this modification is found in Hill which would have been to measure additional directions.

Claims 5, 6, 13, 14, 20, and 21 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Hill(6,819,434) in view of Loopstra et al(6,020,964).

As to claim 5/3, Hill **fails to teach** wherein said at least one third mirror area comprises

a second reflector fixed to said object and a second reference mirror area located in a fixed position with respect to said beam-splitter block,

wherein said second reflector is arranged to direct said second reference beam towards said second reference mirror area.

As to claim 6/3, Hill **fails to teach** wherein at least one third mirror area comprises a fourth mirror area which is fixed to a second object, which is movable with respect to the beam-splitter block.

As to claim 13/11, Hill **fails to teach** wherein said at least one third mirror area comprises a second reflector fixed to said one of the supports and a second reference mirror area located in a fixed position with respect to said beam-splitter

block, wherein said second reflector is arranged to direct said second reference beam towards said second reference mirror area.

As to claim 14/11, Hill **fails to teach** wherein at least one third mirror area comprises a fourth mirror area which is fixed to a second object, which is movable with respect to the beam-splitter block.

As to claim 20/18, Hill **fails to teach** wherein said at least one third mirror area of said interferometer system comprises a second reflector fixed to said one of the supports and a second reference mirror area located in a fixed position with respect to said beam-splitter block, wherein said second reflector is arranged to direct said second reference beam towards said second reference mirror area.

As to claim 21/18, Hill **fails to teach** wherein said at least one third mirror area of said interferometer system comprises a fourth mirror area which is fixed to a second object which is movable with respect to the beam-splitter block.

CLAIMS 5, 6, 13, 14, 20, and 21:

Loopstra et al teach an additional mirror arrangement where a reflector R3 is placed onto the movable stage to deflect one of the beams to an additional reflector 164 mounted onto the projection system. This provides an additional measurement direction along the Z axis when the stage is displaced in the Z direction.

With regard to claims 5, 6, 13, 14, 20, and 21; it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Hill by placing addition reflectors, along an additional axis #3(see the rejection of claims 8,

16, and 23) and on the optics 1108, to measure displacements in the X and Z directions instead of the X and θ directions.

The motivation for this modification is found in Loopstra et al which would have been to measure the Z direction relative to the stage.

Response to Arguments

Applicant's arguments filed 16 October 2007 have been fully considered but they are not persuasive.

35 U.S.C. § 102(e):

Applicant's amendment and arguments with regard to the rejection of claims 3, 4, 7, 9-12, 15, 17-19, 22, and 24 as being clearly anticipated by Hill(6,819,434) is not persuasive.

Applicant argues that Hill fails to disclose the features recited in claims 3, 4, 7, 9-12, 15, 17-19, 22, and 24, see pages 4-6 of Applicant's remarks.

The claims recite a beam-splitter block which is met by the elements 230, 232, and 240-246 of Hill. The limitation of a second reference beam exiting the first reflector in a direction orthogonal to the direction of the first reference beam exiting the beam-splitter block is met by Hill where beam 293 of Hill is the claimed second reference beam and beam 245 of Hill is the claimed first reference beam. The additional limitation of "and away from the beam-splitter block" is still met by Hill because the beam 293 is directed by "the first reflector" 242 of Hill away from elements 240-246 which comprise the differential part of the beam-splitter block,

and away from elements 230,232 which comprise the plane mirror part of the beam-splitter block. Beam 293 is sent directly to the measurement mirror 280, not to any other portion of the beam-splitter block.

35 U.S.C. § 103(a):

Applicant argues that dependent claims 8, 16, and 23 are allowable because they are dependent on claims 3, 11, and 18; and that there is no motivation to modify Hill to form the polygonal volume claimed, thus the rejection is based on improper hindsight, See page 7 of Applicant's remarks.

Hill suggest, at column 17, lines 22-30, that additional linear displacements can be measured by adding an additional beam-splitter in the path of beam 12 and directing the split beam to a second plane mirror interferometer located below the first plane mirror interferometer. Hill does this to provide a second linear displacement measurement. Moreover Hill suggest that a plurality of degrees of freedom can be measured by configuring the beam-splitter assembly to measure additional combinations of linear and angular displacements, see column 4, lines 49-57. The addition of a third, fourth, fifth, etc beam-splitters in the path of beam 12 to generate a plurality of plane mirror or differential measurements would therefor follow from this original suggestion of Hill. For example, an additional plane mirror interferometer can be added above the plane mirror interferometer of figure 2B except that the assembly is rotated by 90 degrees to from a pattern of linear displacement spots that is perpendicular to the linear displacement spots

formed by the plane mirror of figure 2B. These linear measurement spots would be similar to figure 2F.

Any judgment on obviousness is in any sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the invention was made, and does not include knowledge gleaned only from the Applicant's disclosure, such a reconstruction is proper. In re McLaughlin, 443 F.2d 1392; 170 USPQ 209 (CCPA 1971). When considering obviousness of a combination of known element, the operative question is whether the improvement is more than the predicable use of prior art elements according to there established functions. In order to determine obviousness the framework of *Graham vs. John Deere Co.* is followed. Because Hill suggest that by adding additional plane mirror and/or differential arrangements to the beam-assembly, the beam-splitter block, four or more degrees of freedom can be measured. This is a direct teaching from Hill to provide that additional radiation beams and a direct motivation to do so.

Applicant argues that claims 5, 6, 13, 14, 20, and 21 are allowable for the reasons given with regard to claims 3, 11, and 18. Further, Applicant argues that Hill modified by Loopstra et al fails to disclose, teach, or suggest the features of the claims, See page 8 of Applicant's remarks.

It has been held that the test for obviousness is not whether the features of one reference may be bodily incorporated into the other to produce the claimed

subject matter but simply what the combination of references makes obvious to one of ordinary skill in the art in the pertinent art. In re Bozek, 163 USPQ 545 (CCPA 1969). Hill teaches that the reference mirror of the differential interferometer may be attached to a different object, see column 7, lines 1-7. Loopstra et al teach that additional mirror arrangements can be added to the path of an interferometer to change the measurement axis, or measurement direction. This teaching of additional mirrors from Loopstra et al, would have provided the suggestion to modify the Hill such that at least one of the beams of the differential interferometer is reflected to a different object, either stationary or moving. As found in Loopstra et al, see figures 5-8, 11, and 14, these additional mirrors would provide displacement information with regard to an additional degrees of freedom, such as along the Z axis.

Allowable Subject Matter

Claims 1 and 2 are allowed in view of the prior art of record, see pages 1-3 of Applicant's remarks.

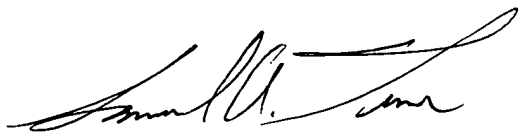
Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Samuel A. Turner whose phone number is 571-272-2432.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr., can be reached on 571-272-2800 ext. 77.

The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Samuel A. Turner
Primary Examiner
Art Unit 2877